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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SCOTT SIBBETT

Appeal 2008-2798
Application 10/738,465
Technology Center 1700

Decided: September 30, 2008

Before CHUNG K. PAK, CHARLES F. WARREN and
PETER F. KRATZ, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1 through 13 and 32, all of the claims pending in the above-identified application. We have jurisdiction pursuant to 35 U.S.C. § 6.

We AFFIRM.

STATEMENT OF THE CASE

The subject matter on appeal is directed to an apparatus useful for separating molecules comprising a first substrate 10 having at least 1,000 open nanoscale channels 14 on its top surface bonded to a second substrate 20 having at least 1,000 open nanoscale channels 24 on its bottom surface. (Spec. ¶¶ [0001], [0017], [0029], [0037] and Figure 5). Figure 5 illustrates a series of alternating channels 24 and 14 in fluid communication with each other, where the angle of intersection of channels 24 and 14 is such that the channels form a zig-zag path. (Spec. ¶¶ [0021] and [0035]-[0037]).

Further details of the appealed subject matter are recited in representative claims 1 and 13, which are reproduced below:

> 1. An apparatus comprising first and second substrates, each of the substrates having a surface containing at least about 1000 open, nanoscale channels disposed therein, the surfaces bonded together such that each of the channels of the first substrate is in fluid communication with at least two of the channels of the second substrate and is misaligned relative to the channels of the second substrate; and wherein the fluid communication between channels creates a continuous nonlinear pathway for a fluid to flow alternatingly between the channels of the first substrate and the channels of the second substrate.
>
> 13. The apparatus of claim 1, wherein the channels of the first substrate are misaligned relative to the channels of the second substrate by an angle of about 0.05° to about 45°, the angle defined by an intersection of a channel of the first substrate and a channel of the second substrate.

As evidence of unpatentability of the claimed subject matter, the Examiner relies upon the following references:

Ramsey	US 2005/0103713 A1	May 19, 2005
Swedberg	5,571,410	Nov. 5, 1996
Holmes	WO 96/12541	May 2, 1996

The Examiner rejects the claims on appeal as follows:

1) Claims 1-11 under 35 U.S.C. § 103(a) as unpatentable over the disclosure of Ramsey;

2) Claims 12 and 13 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Ramsey and Holmes; and

3) Claim 32 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Ramsey and Swedberg.

Appellant appeals from the Examiner's decision rejecting the claims on appeal under § 103(a).

ISSUES

Has Appellant shown reversible error in the Examiner's determination that Ramsey teaches or would have suggested the limitations "at least about 1000 open, nanoscale channels" and "wherein the fluid communication between channels creates a continuous nonlinear pathway for a fluid to flow alternatingly between the channels of the first substrate and the channels of the second substrate" recited in claim 1?

Has Appellant shown reversible error in the Examiner's determination that Ramsey teaches or would have suggested the limitation "the channels of the first substrate are misaligned relative to the channels of the second substrate by an angle of about 0.05° to about 45°" recited in claim 13?

FINDINGS OF FACT (FF)

1. The Specification defines "nanoscale channel" as "any void space in a surface of a substrate having a diameter in at least one direction of about one to about 500 nm." (Spec. ¶ [0015]).
2. Ramsey teaches at ¶ [0003] that:

> The present invention relates to fluidics, involving the act of transporting material through small-scale channels or conduits having microscaled dimensions or smaller and has particular application to nanoscale (<1000 nm) conduits and takes advantage of the dimensional control presently available in thin film technology for the fabrication of microelectronic devices.

3. Ramsey teaches at ¶ [0040] that, "[t]he channel widths are from 110 nm to 370 nm."
4. Ramsey teaches at ¶ [0045] that, "[a] microchannel structure or other connection to a reservoir will . . . be overlaid to deliver materials to the nanochannels."
5. Ramsey teaches at ¶ [0049] that:

> Individually addressable arrays of these ion channel nanopore sensors can be fabricated using the technique described in this application. FIG. **16** schematically depicts how such an array device would be fabricated. Parallel arrays of buried channels **95** would first be formed in a multilayer heterostructure **51**" as illustrated in FIG. **9E** and depicted in **FIG. 16A**. An array of nanopores 96 is then milled through the cover layers of the buried channel device as shown in **FIG. 16B**. The spacing between the nanopores is sufficiently large that they can be individually addressed by orthogonal microchannels **97** formed in a cover member **98** that is bonded over top the nanopore array. A perspective view of the assembly shown in **FIG. 16C** is shown in **FIG. 17**. The buried channel features formed in the multilayer heterostructure **51**" are in a different plane of the device than the

> microchannels in the cover member **97**. The spacing of the nanopores and the cover member microchannels can be designed such that only a single nanopore **96** connects any given buried channel **95** and cover a number of channels **97**. Ion channels or other nanopore sensing elements **99** can be delivered to the nanopores 96 through the cover member microchannels. Delivery of specific nanopore sensing elements can be achieved by electrically biasing the individual nanopores in a given channel so that the target nanopore attracts the sensing element while all other nanopores are biased to repel the sensing element. After a sensing element is inserted into a nanopore, the microchannel can be filled with a different sensing element and another nanopore biased for insertion of the new sensing element.

6. Ramsey teaches at ¶ [0028] that

> The present invention provides a nanoscale analytic device having a small-scale flow channel which is precisely dimensioned to either pass or block components in a test fluid based on the molecular size of the components. The flow area will pass components whose molecules are smaller in transverse cross-section than the flow area and will block passage of molecules whose cross-section is larger than the flow area, thereby enabling separation of the fluid into one phase with molecules larger than the flow area and a remaining phase which has molecules smaller in cross-section than the flow area.

7. Ramsey's Figures 16 and 17 illustrate channels 95 intersect channels 97 at a 90° angle.

PRINCIPLES OF LAW

Under 35 U.S.C. § 103, the factual inquiry into obviousness requires a determination of: (1) the scope and content of the prior art; (2) the differences between the claimed subject matter and the prior art; (3) the level

of ordinary skill in the art; and (4) secondary considerations, if any. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966).

As our reviewing court stated in *In re Schreiber*, 128 F.3d 1473, 1478 (Fed. Cir. 1997):

> A patent applicant is free to recite features of an apparatus either structurally or functionally. *See In re Swinehart*, 58 C.C.P.A. 1027, 439 F.2d 210, 212, 169 USPQ 226, 228 (CCPA 1971) ("[T]here is nothing intrinsically wrong with [defining something by what it does rather than what it is] in drafting patent claims."). Yet, choosing to define an element functionally, i.e., by what it does, carries with it a risk. As our predecessor court stated in *Swinehart*, 439 F.2d at 213, 169 USPQ at 228:
>
> > where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.
>
> .

When the claimed and prior art articles or apparatuses appear to be identical or substantially identical, the Examiner can require an applicant to prove that the prior art article or apparatus does not necessarily or inherently possess the functional characteristics of the claimed article or apparatus. *See In re Best*, 562 F.2d 1252, 1255 (CCPA 1977).

"In cases involving overlapping ranges, we and our predecessor court have consistently held that even a slight overlap in range establishes a prima facie case of obviousness." *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003).

Appellant has the burden of showing unexpected results with respect to the claimed subject matter. *See* e.g., *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972).

ANALYSIS

Rejection (1): Claims 1-11 under 103(a)[1]

Appellant does not dispute the Examiner's determination that Ramsey teaches the first substrate having nanoscale channels bonded to the second substrate having nanoscale channels. (*Compare* Ans. 4-10 *with* App. Br. 6-9 and Reply Br. 5-9; *see* FF 1-5). Appellant also does not dispute the Examiner's determination that Ramsey teaches the limitation "each of the channels of the first substrate is in fluid communication with at least two of the channels of the second substrate and is misaligned relative to the channels of the second substrate" recited in claim 1. (*Compare* Ans. 4-10 *with* App. Br. 6-9 and Reply Br. 5-9; *see* FF 5-7). Appellant only contends that Ramsey would not have suggested (1) the claimed number of channels in the substrates and (2) the limitation "wherein the fluid communication between channels creates a continuous nonlinear pathway for a fluid to flow alternatingly between the channels of the first substrate and the channels of the second substrate" recited in claim 1. (App. Br. 6-7 and Reply Br.5-6). We do not agree.

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[1] Appellant's arguments for patentability are based solely on the limitations of claim 1. Therefore, we select claim 1 as the representative claim consistent with 37 C.F.R. § 41.37(c)(1)(vii).

With respect to the claimed number of channels, Ramsey teaches a nanoscale analytic device comprising, *inter alia*, a parallel array of buried channels 95 connected to a number of channels 97 via an array of nanopores 96. (FF 5, 6). The number of channels 95 and 97 taught by Ramsey are inclusive of the claimed number of channels. There is nothing in Ramsey which indicates that the claimed number of channels are not useful for separating small molecules from larger molecules in the manner taught by Ramsey. (FF 5, 6). Thus, we determine that the Examiner has properly determined that it would have been prima facie obvious to one of ordinary skill in the art to employ the claimed number of channels.

With respect to the functional limitation "wherein the fluid communication between channels creates a continuous nonlinear pathway for a fluid to flow alternatingly between the channels of the first substrate and the channels of the second substrate" recited in claim 1, we determine that Ramsey's nanoscale analytic device illustrated in Figures 16A-D and 17 is capable of meeting this functional claim limitation. Like Appellant, Ramsey's nanoscale analytic device shown in Figures 16A-D and 17 illustrates a series of alternating channels in fluid communication with each other, where each connection in the series forms an angle. (*Compare* Ramsey Figures 16A-D and 17 and FF 5-7 *with* Spec. ¶¶ [0021] and [0035]-[0037]). In this regard, Ramsey teaches a first channel 97 having a linear path in fluid communication with another channel 95 having a linear path at an angle via a nanopore 96. (Ramsey Figures 16A-D and 17 and FF 5). Channel 95, in turn, is in fluid communication with another channel 97

having a linear path at an in angle via another nanopore 96. *Id.* These channels form a zig-zaging path that is continuous and nonlinear. *Id.*

Thus, it is reasonable to believe that Ramsey's nanoscale analytic device is capable of performing the claimed function, i.e., allowing a fluid to flow alternatingly between the channels of the first substrate and the channels of the second substrate as recited in claim 1. The burden is, therefore, on Appellant to show that Ramsey's zig-zaging path is incapable of performing the claimed function. However, on this record, Appellant has not done so.

Accordingly, based on the factual findings set forth in the Answer and above, we affirm the Examiner's decision rejecting claims 1-11 under 35 U.S.C. § 103(a).

Rejection (2): Claims 12 and 13 under 103(a)[2]

The Examiner determines that "the selection of the angle would be only an engineering choice of dimensioning." (Ans. 9). Appellant, on the other hand, contends that Ramsey does not teach, nor would have suggested, the limitation "wherein the channels of the first substrate are misaligned relative to the channels of the second substrate by an angle of about 0.05° to about 45°" recited in claim 13. (App. Br. 7-8 and Reply Br. 6-8). We do not agree.

[2] Appellant's arguments for patentability are based solely on the limitations of claim 13. Therefore, we select claim 13 as the representative claim consistent with 37 C.F.R. § 41.37(c)(1)(vii).

Although Figure 17 of Ramsey illustrates that channels 95 and 97 intersect at a 90° angle, we determine that Ramsey does not limit this angle to only 90°. (*See* Ramsey in its entirety and FF 7). Ramsey broadly teaches a nanoscale analytic device having channels 97 connected to channels 95 via an array of nanopores 96 in order to separate smaller molecules from larger molecules. (FF 5, 6). Implicit in this teaching is that channels 97 and 95 may intersect at any angle, which includes the claimed angles, so long as the smaller molecules are capable of traveling from channels 97 to channels 95 via the nanopores 96.

Thus, we determine that that it would have been prima facie obvious to one of ordinary skill in the art to employ the channels in the claimed angles, with a reasonable expectation of successfully separating smaller molecules from larger molecules.

Appellant also repeats the same arguments directed to independent claim 1 in the context of dependent claims 13. (App. Br. 7-8 and Reply Br. 6-8). Thus, based on the same Factual Findings and conclusions set forth above, we determine that Ramsey would have rendered the subject matter recited in claim 13 obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103(a)[3].

Accordingly, based on the Factual Findings set forth in the Answer and above, we affirm the Examiner's decision rejecting claims 12 and 13 under 35 U.S.C. § 103(a).

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[3] We note that a discussion of Holmes is unnecessary to resolve the issue raised.

Rejection (3): Claim 23 under 103(a)

Appellant does not dispute the Examiner's determination that it would have been obvious to employ the features recited in dependent claim 23. (*Compare* Ans. 6, 9 *with* App. Br. 6-9 and Reply Br. 5-9). Rather, Appellant repeats the same arguments directed to independent claim 1. (App. Br. 8-9 and Reply Br. 8). Thus, based on the same Factual Findings and conclusions set forth above, we concur with the Examiner that Ramsey and Swedberg would have rendered the subject matter recited in claim 23 obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103(a).

Accordingly, based on the Factual Findings set forth in the Answer and above, we affirm the Examiner's decision rejecting claim 23 under 35 U.S.C. § 103(a).

ORDER

The decision of the Examiner is affirmed.

TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

tf/ls

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